AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

1. (Currently Amended) A method for plasma plating comprising:

positioning a substrate with a threaded surface on a platform within a vacuum chamber, wherein an inwardly facing surface of the substrate faces a center of the platform and an outwardly facing surface of the substrate faces an edge of the platform;

positioning a depositant in an evaporation source within the vacuum chamber, the depositant includes at least a first metal;

reducing an initial pressure in the vacuum chamber to at or below 4 milliTorr;

flowing a gas through the vacuum chamber at a rate to raise the pressure in the vacuum chamber to at or between 0.1 milliTorr and 4 milliTorr;

applying a negative dc signal to the substrate at a voltage amplitude at or between one to 1,500;

applying a radio frequency signal to the substrate at a power level at or between 1 watt and 50 watts; and

heating the depositant to a temperature at or above the melting point of the depositant, whereby a plasma is generated in the vacuum chamber, the plasma includes a mixture of positively charged depositant ions and negatively charged electrons, and the depositant ions are plated on the threaded surface of the substrate to create a plated threaded surface, the inwardly facing surface and the outwardly facing surface of the substrate

to create plated surfaces, and wherein the plated threaded surface reduces galling between the plated threaded surface and a surface of a mated component.

2. (Previously Presented) The method of Claim 1, wherein the initial pressure is reduced in the vacuum chamber to at or below 1.5 milliTorr, and wherein gas is flowed through the vacuum chamber at a rate to raise the pressure in the vacuum chamber to at or between 0.5 milliTorr and 1.5 milliTorr.

3. (Previously Presented) The method of Claim 1, wherein the negative dc signal is applied to the substrate at a voltage amplitude at or between negative 500 volts and negative 750 volts.

4. (Previously Presented) The method of Claim 1, wherein the power level is provided at or between 5 watts and 15 watts.

5. (Previously Presented) The method of Claim 1, wherein the power level is around 10 watts.

6. (Canceled)

7. (Previously Presented) The method of Claim 1, wherein the initial pressure is reduced in the vacuum chamber to at or below 1.5 milliTorr, and the gas is flowed through the vacuum chamber at a rate to raise the pressure in the vacuum chamber to at or between 0.5 milliTorr and 1.5 milliTorr, wherein a negative dc signal is applied to the substrate at a voltage amplitude at or between negative 500 volts and negative 750 volts, and wherein the power level is provided at or between 5 and 15 watts.

8. (Canceled).

9. (Currently Amended) The method of Claim ~~8~~ 1, wherein the platform is a turntable operable to rotate the substrate.

10. (Original) The method of Claim 9, further comprising: rotating the turntable at a revolutions per minute rate at or between 5 revolutions per minute and 30 revolutions per minute.

11. (Previously Presented) The method of Claim 9, further comprising:

rotating the turntable at a rotational rate of revolutions per minute at or between 12 revolutions per minute and 15 revolutions per minute.

12. (Original) The method of Claim 9, wherein the turntable includes an electrically conductive material that provides an electrically conductive path to the substrate, and applying the dc signal to the substrate and applying the radio frequency signal to the substrate include applying the dc signal and the radio frequency signal to the electrically conductive material of the turntable.

13. (Previously Presented) The method of Claim 12, wherein the dc signal and the radio frequency signal are applied to the electrically conductive material of the turntable using a commutator.

14. (Previously Presented) The method of Claim 12, wherein the dc signal and the radio frequency signal are applied to the electrically conductive material of the turntable using an electrically conductive brush.

15. (Original) The method of Claim 8, wherein the platform is included as part of the vacuum chamber.

16. (Original) The method of Claim 8, wherein the platform is a flat surface.

17. (Original) The method of Claim 8, wherein the platform includes a horizontal surface.

18.-23. (Canceled)

24. (Original) The method of Claim 8, wherein the platform includes an electrically conductive material.

25. (Original) The method of Claim 8, wherein the platform is a conductive plate.

26. (Canceled)

27. (Previously Presented) The method of Claim 1, further comprising:

mixing the dc signal and the radio frequency signal to generate a mixed signal, and wherein the dc signal and the radio frequency signal includes applying the mixed signal to the substrate.

28. (Original) The method of Claim 27, wherein the mixing the dc signal and the radio frequency signal includes mixing a negative dc signal and the radio frequency signal.

29. (Original) The method of Claim 27, further comprising:

balancing the mixed signal by minimizing the standing wave reflected power.

30. (Original) The method of Claim 29, wherein minimizing the standing wave reflected power is achieved using a manual control.

31. (Original) The method of Claim 29, wherein minimizing the standing wave reflected power is achieved using an automatic control.

32. (Previously Presented) The method of Claim 1, further comprising:

positioning the evaporation source relative to the substrate.

33. (Previously Presented) The method of Claim 32, wherein positioning the evaporation source includes positioning the evaporation source a distance from the substrate.

34. (Previously Presented) The method of Claim 33, wherein the distance is at or between 0.1 inches and 6 inches when the depositant in the evaporation source is to be deposited as a base layer.

35. (Previously Presented) The method of Claim 34, wherein the distance is at or between 2.75 inches and 3.25 inches when the depositant in the evaporation source is to be deposited as the base layer.

36. (Previously Presented) The method of Claim 33, wherein the distance is at or between 0.1 inches and 6 inches when the depositant in the evaporation source is to be deposited as a transition layer.

37. (Previously Presented) The method of Claim 36, wherein the distance is at or between 2.75 inches and 3.25 inches when the depositant in the evaporation source is to be deposited as the transition layer.

38. (Previously Presented) The method of Claim 33, wherein the distance is at or between 0.1 inches and 6 inches when the depositant in the evaporation source is to be deposited as a working layer.

39. (Previously Presented) The method of Claim 38, wherein the distance is at or between 2.0 inches and 2.5 inches when the depositant in the evaporation source is to be deposited as the working layer.

40. (Previously Presented) The method of Claim 1, further comprising:

positioning the evaporation source relative to the substrate;

positioning a second depositant, which is made of the same material as the depositant, in a second evaporation source within the vacuum chamber; and

positioning the second evaporation source relative to the substrate.

41. (Previously Presented) The method of 40, further comprising positioning the evaporation source a distance from the second evaporation source.

42. (Previously Presented) The method of Claim 41, wherein the distance is at or between 0.1 inches and 6 inches when the depositant in the evaporation source is to be deposited as a base layer.

43. (Previously Presented) The method of Claim 42, wherein the distance is at or between 3.0 inches and 4.0 inches when the depositant in the evaporation source is to be deposited as the base layer.

44. (Previously Presented) The method of Claim 41, wherein the distance is at or between 0.1 inches and 6 inches when the depositant in the evaporation source is to be deposited as a transition layer.

45. (Previously Presented) The method of Claim 44, wherein the distance is at or between 3.0 inches and 4.0 inches when the depositant in the evaporation source is to be deposited as the transition layer.

46. (Previously Presented) The method of Claim 41, wherein the distance is at or between 0.1 inches and 6 inches when the depositant in the evaporation source is to be deposited as a working layer.

47. (Previously Presented) The method of Claim 46, wherein the distance is at or between 2.5 inches and 3.0 inches when the depositant in the evaporation source is to be deposited as the working layer.

48. (Previously Presented) The method of Claim 1, further comprising:

an array of substrates, and the substrate is provided as one of the array of substrates;

positioning the evaporation source relative to outwardly facing surfaces of the array of substrates;

positioning a second depositant in a second evaporation source within the vacuum chamber; and

positioning the second evaporation source relative to inwardly facing surfaces of the array of substrates.

49. (Previously Presented) The method of 48, wherein the total mass of the second depositant is 20 to 80 percent less than the total mass of the depositant.

50. (Previously Presented) The method of 49, wherein the total mass of the second depositant is 40 to 50 percent less than the total mass of the depositant.

51. (Canceled)

52. (Previously Presented) The method of Claim 1, further comprising:

positioning a second depositant in a second evaporation source within the vacuum chamber before reducing the initial pressure in the vacuum chamber to at or below 4 milliTorr; and

heating the second depositant to at or above the melting point of the second depositant, whereby a second plasma is generated in the vacuum chamber, the second plasma includes a mixture of positively charged second depositant ions and negativel charged electrons, and the second depositant ions are plated on the threaded surface of the substrate.

53. (Original) The method of Claim 52, wherein the depositant forms a base layer on the substrate and the second depositant forms a working layer on the base layer.

54. (Previously Presented) The method of Claim 52, further comprising:

positioning a third depositant in a third evaporation source within the vacuum chamber before reducing the initial pressure in the vacuum chamber to at or below 4 milliTorr; and

heating the third depositant to a temperature at or above the melting point of the third depositant, whereby a third plasma is generated in the vacuum chamber, the third plasma includes a mixture of positively charged third depositant ions and negatively charged electrons, and the third depositant ions are plated on the substrate.

55. (Original) The method of Claim 54, wherein the depositant forms a base layer on the substrate, the second depositant forms a transition layer on the base layer, and the third depositant forms a working layer on the transition layer.

56. (Previously Presented) The method of Claim 1, wherein the radio frequency signal is provided at a frequency above one kilohertz range.

57. (Previously Presented) The method of Claim 1, wherein the radio frequency signal is provided at a frequency above one megahertz range.

58. (Original) The method of Claim 1, wherein the radio frequency signal is provided at a frequency of 13.56 kilohertz.

59. (Original) The method of Claim 1, wherein the radio frequency signal is provided at a frequency reserved for industrial applications.

60. (Original) The method of Claim 1, further comprising:

cleaning the substrate to remove foreign materials and oils.

61. (Original) The method of Claim 1, further comprising:

cleaning the substrate to achieve white metal clean.

62. (Original) The method of Claim 1, further comprising:

cleaning the substrate before positioning the substrate within the vacuum chamber.

63.-66. (Canceled)

67. (Original) The method of Claim 62, wherein the cleaning the substrate includes abrasively blasting the substrate.

68. (Original) The method of Claim 1, wherein the gas is introduced through a control valve.

69. (Canceled)

70. (Original) The method of Claim 1, wherein the depositant is a metal alloy.

71. (Original) The method of Claim 1, wherein the depositant is gold.

72. (Original) The method of Claim 1, wherein the depositant is titanium.

73. (Original) The method of Claim 1, wherein the depositant is chromium.

74. (Original) The method of Claim 1, wherein the depositant is nickel.

75. (Original) The method of Claim 1, wherein the depositant is silver.

76. (Original) The method of Claim 1, wherein the depositant is tin.

77. (Original) The method of Claim 1, wherein the depositant is indium.

78. (Original) The method of Claim 1, wherein the depositant is lead.

79. (Original) The method of Claim 1, wherein the depositant is copper.

80. (Original) The method of Claim 1, wherein the depositant is palladium.

81. (Original) The method of Claim 1, wherein the depositant is a silver/palladium metal alloy.

82. (Original) The method of Claim 1, wherein the depositant is carbon.

83.-84. (Canceled)

85. (Original) The method of Claim 1, wherein the depositant is a metal carbide.

86. (Original) The method of Claim 1, wherein the depositant is a metal nitride.

87. (Original) The method of Claim 1, wherein the depositant is provided in a form from the class consisting of a pellet, a wire, a granule, a powder, a ribbon, and a strip.

88. (Original) The method of Claim 1, wherein the gas is an inert gas.

89. (Canceled)

90. (Original) The method of Claim 1, wherein the gas is argon.

91. (Original) The method of Claim 1, wherein the gas is xenon.

92. (Original) The method of Claim 1, wherein the gas is radon.

93. (Original) The method of Claim 1, wherein the gas is helium.

94. (Original) The method of Claim 1, wherein the gas is neon.

95. (Original) The method of Claim 1, wherein the gas is krypton.

96. (Original) The method of Claim 1, wherein the gas is oxygen.

97. (Original) The method of Claim 1, wherein the gas is nitrogen.

98. (Original) The method of Claim 1, wherein the gas is noncombustible.

99. (Original) The method of Claim 1, wherein the plasma includes gas ions and depositant ions.

100. (Original) The method of Claim 99, wherein the gas ions and the depositant ions of the plasma include positively charged ions.

101. (Original) The method of Claim 99, wherein the gas ions and the depositant ions of the plasma include negatively charged ions.

102. (Previously Presented) The method of Claim 1, wherein the gas is argon and the depositant is a metal alloy of silver/palladium, and the plasma includes argon ions and silver/palladium ions.

103. (Previously Presented) The method of Claim 1, wherein the evaporation source is a tungsten basket.

104. (Canceled)

105. (Previously Presented) The method of Claim 1, wherein the evaporation source is a coil.

106.-110. (Canceled)

111. (Previously Presented) The method of Claim 1, wherein heating the depositant includes supplying a current through the evaporation source.

112. (Previously Presented) The method of Claim 111, wherein heating the depositant includes incremental staging of the current to the evaporation source to achieve an even heat distribution in the depositant.

113. (Original) The method of Claim 111, wherein the current is an alternating current.

114. (Previously Presented) The method of Claim 113, wherein the amplitude of the alternating current is controllably increased such that the depositant is uniformly heated and melted.

115.-116. (Canceled)

117. (Original) The method of Claim 1, wherein the method does not include the addition of a magnet to produce a magnetic field near the substrate that affects the attraction of the ions of the plasma to the substrate.

118. (Previously Presented) The method of Claim 1, wherein the plasma forms a layer on the substrate to create the plated threaded surface at a thickness at or between 500 and 20,000 Angstroms.

119. (Previously Presented) The method of Claim 1, wherein the plasma forms a layer on the substrate to create the plated threaded surface at a thickness at or between 3,000 and 10,000 Angstroms.

120. (Previously Presented) The method of Claim 1, wherein the plasma forms a layer on the substrate to create the plated threaded surface that can be controlled to a thickness of 500 Angstroms.

121. (Previously Presented) The method of Claim 1, further comprising:

backsputtering the substrate before heating the depositant to a temperature at or above the melting point of the depositant.

122. (Previously Presented) The method of Claim 1, further comprising:

performing backsputtering before heating the depositant that includes:

reducing the pressure in the vacuum chamber to at or below 100 milliTorr;

flowing a gas through the vacuum chamber at a rate to raise the pressure in the vacuum chamber to at or between 20 milliTorr and 100 milliTorr;

applying a dc signal to the substrate at a voltage amplitude at or between 1 volt and 4000 volts; and

applying a radio frequency signal to the substrate at a power level at or between 1 watt and 50 watts.

123. (Previously Presented) The method of Claim 122, wherein reducing the pressure in the vacuum chamber includes reducing the pressure in the vacuum chamber to at or below 50 milliTorr, and wherein flowing the gas through the vacuum chamber at a rate to raise the pressure in the vacuum chamber to at or between 20 milliTorr and 100 milliTorr includes flowing the gas through the vacuum chamber at a rate to raise the pressure to at or between 20 milliTorr and 50 milliTorr.

124. (Original) The method of Claim 122, wherein applying the dc signal to the substrate at a voltage amplitude at or between 1 volt and 4000 volts includes applying a dc signal to the substrate at a voltage amplitude at or between 100 volts and 250 volts.

125. (Previously Presented) The method of Claim 122, wherein applying the radio frequency signal to the substrate at a power level at or between 1 watt and 50 watts includes applying the radio frequency signal at a power level at or between 5 and 15 watts.

126. (Original) The method of Claim 122, wherein applying the dc signal to the substrate includes applying the dc voltage at a negative polarity.

127. (Original) The method of Claim 122, wherein backsputtering is performed for a period of time at or between 30 seconds and one minute.

128. (Original) The method of Claim 122, wherein backsputtering is performed until the rate of visible microarcing is significantly reduced.

129. (Currently Amended) A method for plasma plating comprising:

positioning a substrate with a threaded surface <u>on a platform</u> within a vacuum chamber<u>, wherein an inwardly facing surface of the substrate faces a</u>

center of the platform and an outwardly facing surface of the substrate faces an edge of the platform;

positioning a depositant in the vacuum chamber;

reducing an initial pressure in the vacuum chamber to at or between 0.5 milliTorr and 1.5 milliTorr;

applying a negative dc signal to the substrate at a voltage amplitude at or between 500 volts and 750 volts;

applying a radio frequency signal to the substrate at a power level at or between 1 watt and 50 watts; and

heating the depositant to a temperature at or above the melting point of the depositant, whereby a plasma is generated in the vacuum chamber, the plasma includes a mixture of positively charged depositant ions and negatively charged electrons, and the depositant ions are plated on the threaded surface of the substrate to create a plated threaded surface, the inwardly facing surface and the outwardly facing surface of the substrate to create plated surfaces, and wherein the plated threaded surface reduces galling between the plated threaded surface and a surface of a mated component.

130.-131. (Canceled)

132. (Previously Presented) The method of Claim 129, wherein the power level is provided.

133.-150 (Canceled)

151. (Currently Amended) A method for plasma plating comprising:

positioning a substrate with a threaded surface on a platform within a vacuum chamber, wherein an inwardly facing surface of the substrate faces ~~the~~ a

center of the platform and an outwardly facing surface of the substrate faces an edge of the platform and wherein the platform further comprises a turntable operable to rotate the substrate;

positioning a first depositant in a first set of filaments within the vacuum chamber, the depositant includes at least a first metal;

positioning a second depositant in a second set of filaments within the vacuum chamber, wherein the first set and second set of filaments are arranged so that rotation of the turntable moves the inwardly facing surface of the substrate past the first set of filaments at a first time and the outwardly facing surface of the substrate past the second set of filaments at a second time;

reducing an initial pressure in the vacuum chamber to at or below 4 milliTorr;

flowing a gas through the vacuum chamber at a rate to raise the pressure in the vacuum chamber to at or between 0.1 milliTorr and 4 milliTorr;

applying a negative dc signal to the substrate at a voltage amplitude at or between one to 1,500 volts;

applying a radio frequency signal to the substrate at a power level at or between 1 watt and 50 watts; and

heating the first depositant and the second depositant to temperatures at or above their respective melting points, whereby a plasma is generated in the vacuum chamber, the plasma includes a mixture of positively charged first and second depositant ions and negatively charged electrons, and the first and second depositant ions are plated on the threaded surface, the inwardly facing surface and the outwardly facing surface of the substrate to create plated surfaces, and wherein the plated surfaces reduce galling between the plated surfaces and mating surfaces of a mated component.